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JDF-3 DNA polymerase genomic sequence (SEQ ID NO: 4)

AATTCCACTGCCGTGTTTAACCTTTCCACCGTTGAACTTGAGGGTGATTT TCTGAGCCTCCTCAATCACTTAATCGAGACCGCGGATTACCTTGAACTGG TACACGTTCAACGATTCGGTTCTTGTAATGGTCGATACTGGGCCGTGCTG GATTTTCTAAACGTCTCAAGAACGGCTTTCATCAACGGAAACTGCCACGT 5' untranslated sequence CTCCGCCGTCGTGAGGGTTAAACCTGAAGTTCAAGACTTTGCAACGGAAT GGCGAGAGAACGCCGACTACCCCAGTGGAAGAGCTTTTGAAAGCCAAAGC CGAGCTTCAGCGAATGTGCGGTGCCCTTGTTCAAGAGTTGTGAGCCCTTG ATTGTTGTTTTCTCCTCTTTTCTGATAACATCGATGGCGAAGTTTATTAG TTCTCAGTTCGATAATCAGGCAGGTGTTGGTC

ATGATCCTTGACGTTGAT

TACATCACCGAGAATGGAAAGCCCGTCATCAGGGTCTTCAAGAAGGAGAA CGGCGAGTTCAGGATTGAATACGACCGCGAGTTCGAGCCCTACTTCTACG CGCTCCTCAGGGACGACTCTGCCATCGAAGAAATCAAAAAGATAACCGCG GAGAGGCACGGCAGGGTCGTTAAGGTTAAGCGCGCGGAGAAGGTGAAGAA AAAGTTCCTCGGCAGGTCTGTGGAGGTCTGGGTCCTCTACTTCACGCACC CGCAGGACGTTCCGGCAATCCGCGACAAAATAAGGAAGCACCCCGCGGTC ATCGACATCTACGAGTACGACATACCCTTCGCCAAGCGCTACCTCATAGA CAAGGGCCTAATCCCGATGGAAGGTGAGGAAGAGCTTAAACTCATGTCCT TCGACATCGAGACGCTCTACCACGAGGGAGAAGAGTTTGGAACCGGGCCG ATTCTGATGATAAGCTACGCCGATGAAAGCGAGGCGCGCGTGATAACCTG GAAGAAGAŤCGACCTTCCTTACGTTGAGGTTGTCTCCACCGAGAAGGAGA TGATTAAGCGCTTCTTGAGGGTCGTTAAGGAGAAGGACCCGGACGTGCTG ATAACATACAACGGCGACAACTTCGACTTCGCCTACCTGAAAAAGCGCTG AGATACAGCGCATGGGGGACAGGTTTGCGGTCGAGGTGAAGGGCAGGGTA CACTTCGACCTTTATCCAGTCATAAGGCGCACCATAAACCTCCCGACCTA CACCCTTGAGGCTGTATACGAGGCGGTTTTCGGCAAGCCCAAGGAGAAGG TCTACGCCGAGGAGATAGCCACCGCCTGGGAGACCGGCGAGGGGCTTGAG AGGGTCGCGCGCTACTCGATGGAGGACGCGAGGGTTACCTACGAGCTTGG CAGGGAGTTCTTCCCGATGGAGGCCCAGCTTTCCAGGCTCATCGGCCAAG GCCTCTGGGACGTTTCCCGCTCCAGCACCGGCAACCTCGTCGAGTGGTTC CTCCTAAGGAAGGCCTACGAGAGGAACGAACTCGCTCCCAACAAGCCCGA CGAGAGGGAGCTGGCGAGGAGAAGGGGGGGCTACGCCGGTGGCTACGTCA AGGAGCCGGAGCGGGACTGTGGGACAATATCGTGTATCTAGACTTTCGT AGTCTCTACCCTTCAATCATAATCACCCACAACGTCTCGCCAGATACGCT AGTTCTGCAAGGACTTCCCCGGCTTCATTCCGAGCCTGCTCGGAAACCTG CTGGAGGAAAGGCAGAAGATAAAGAGGAAGATGAAGGCAACTCTCGACCC GCTGGAGAAGAATCTCCTCGATTACAGGCAACGCGCCATCAAGATTCTCG CCAAC

AGCCTTCTTCCCGGGGAGTGGGTTGCGGTCATTGAAGGGGGGAAA CTCAGGCCCGTCCGCATCGGCGAGCTGGTTGATGGACTGATGGAAGCCAG CGGGGAGAGGGTGAAAAGAGACGGCGACACCGAGGTCCTTGAAGTCGAGG GGCTTTACGCCTCTCCTTCGACAGGGAGTCCAAGAAAGCCCGCACAATGC CGGTGAAAGCCGTGATAAGGCACCGCTATGCCGGGGAAGTTTACAGAATA GCTCTCAACTCCGGAAGGAGGATTAAGCGTGACGCGCGCCACAGCCTCT TCGCGTACCGGGACGCGAGCTTGTGGAGGTGACGGGGGGAGGAGGTTC AAGCCCGGCGACCTCCTGGCGGTGCCAAGCGGATAACCCTCCCGGAGAGG

Intein 1



AGGGAGAGGCTCAACATCGTTGAACTGCTCCTCGAACTGCCCGAGGAGGA AGGGGAATGCTCAGAACCCTCCGCTGGATTTTCGGGGAGGAGAAGACCGG Intein 1 AGGGCGGCCAGGCGCTACCTGGAGCACCTTGCGTGGGCTCGGCTACGTGA GTACCGCGCTTCTACGAGAGGCTCGTGGAGGTAATCCGCTACAACGGCAA CAGGGGGGAGTTCATCGCCGATTTCAACGCGCTCCGCCCCGTCCTCCGCC TGATGATGCCCGAGAAGGAGCTTGAAGAGTGGCTCGTTGGGACGAGGAAC GGGTTCAGGATAAGGCCGTTCATAGAGGTTGATTGGAAGTTCGCAAAGCT CCTCGGCTACTACGTGAGCGAGGGGGGGCGCGGGAAGTGGAAAAACCGGA CCGGGGGCTGGAGCTACTCGGTGAGGCTTTACAACGAGGACGGGAGCGTT CTCGACGACATGGAGAGACTCGCGAGGAGTTCTTTGGGGGGCGTGAGCGCG GGGGGAACTACGTCGAGATTTCAAAGAAGATGGCCTACATAATCTTCGAG GGGCTCTGCGGTTCACCGGCCGAGAACAAGAGGGTTCCGTGGCTTATCTT CACGTCCCCTGAGGAGGTCCGCTGGGCCTTCCTTGAGGGGTACTTCATCG GCGACGGCGACGTTCACCCGAGCAAGATGGTTCGGCTCTCCACCAAGAGC GAGCTTCTGGCTAACGGCCTCGTCCTGCTCCTGAACTCGCTGGGCGTCTC AGCGATAAACGTCCGCCACGACAGCGGGGTTTACAGGGTCTACGTGAACG AGGAACTGCCCTTTACAGAGTACCGGAAGCGGGAAGAACGCCTCACTTACT CCCACGTCATACCGAGGGAAGTGCTGGAGGAGACTTCGGCCGGGCCTTCC AGAAGAACATGAGTCACGGGAAATTCAGGGAGCTGGTGGAAAGCGGGGAG CTCGACGCGGAAAGGGCCGGTAGGATAGGCTGGCTCCTCGACGGGGATAT AGTCCTCGACAGGGTCTCGGAAGTCAGGAAGGAAAGCTACGAGGGGTACG TCTACGACCTGAGCGTTGAGGAGGACGAGAACTTCTGGCGGGCTTTGGGT

AGCTACTACGGCTACTACGGCTATGCCAGGG CAAGATGGTACTGCAGGGAGTGCGCCGAGAGCGTTACGGCATGGGGAAGG GAGTACATCGAAATGGTCATCAGAGAGCTTGAGGAAAAGTTCGGTTTTAA AGTCCTCTATGCAGACACAGACGGTCTCCATGCCACCATTCCTGGAGCGG ACGCTGAAACAGTCAAGAAAAAGGCAATGGAGTTCTTAAACTATATCAAT CCCAAACTGCCCGGCCTTCTCGAACTCGAATACGAGGGCTTCTACGTCAG GGGCTTCTTCGTCACGAAGAAAAGTACGCGGTCATCGACGAGGAGGGCCA AGATAACCACGCGCGGGCTTGAGATAGTCAGGCGCGACTGGAGCGAGATA GCGAAGGAGACGCAGGCGAGGGTTTTGGAGGCGATACTCAGGCACGGTGA Extein 2 CGTTGAAGAGGCCGTCAGAATTGTCAGGGAAGTCACCGAAAAGCTGAGCA AGTACGAGGTTCCGCCGGAGAAGCTGGTTATCCACGAGCAGATAACGCGC GAGCTCAAGGACTACAAGGCCACCGGCCCGCACGTAGCCATAGCGAAGCG TTTGGCCGCCAGAGGTGTTAAAATCCGGCCCGGAACTGTGATAAGCTACA TCGTTCTGAAGGGCTCCGGAAGGATAGGCGACAGGGCGATTCCCTTCGAC GAGTTCGACCCGACGAAGCACAAGTACGATGCGGACTACTACATCGAGAA CCAGGTTCTGCCGGCAGTTGAGAGAATCCTCAGGGCCTTCGGCTACCGCA AGGAAGACCTGCGCTACCAGAAGACGAGGCAGGTCGGGCTTGGCGCGTGG CTGAAGCCGAAGGGGAAGAAGTGA

TCCTCTACGCGCACAACNN

GGAATTATCTGGTTTCTTTTCCC

AGCATTAAATGCTTCCGACATTGCCTTATTTATGAAACTCCTGTTGTGCC TGAGTTTGTGCCAGAAAACAGCCTGTTCTGACGGCGCTTTTTCTTGCCAG GTCTCTTGAGTTTCGCAAGGGTCTTCTCGACCAGCTCAATGGTCTTGTCG TCATTGTTTNNNNNNNNNNNNNNNNNNNCCCGGGGACTTCATACTGGC GGTAATAGACAGGGATTCCTTCCTCAAGGACTTCCCGGGAGGCATTGGAG TTTTTTGGTGGGGCTTTCACAGGATTTGCTCATCTTGTGGATTTCTCGTT CGATTGAATCTGTCCACTTGAGGGTGTAGGTCGAGACGGTGGAGCGCGTA



TTCCGGGAGCGGTCTTGAGGCTCCATTTTTCAGTCCTCCGGCGAAG 3' Untranslated sequence AAGTGGAACTCAAGCCGGGTGTTAGCTTATGTTATGTTCCCAACTCCTCC AGCACCTCCAGGATCCCCTCAATCCCGGAACCTCGAAGCCCCTCTCGTGG ATCTTTCTAACTTCCTCTGCCTCCGGGTTTATCCAGACCGCCCACATGCC GGCTCTCAGCGCACCCTCGAAATCCTCCGCGTAGGTGTCGCCGATGTGGA TTGCCTCGTCCGGCTCGACCCCGAAGCATCGAGCGGTTTTCTGAACATCT CGGGCATCGGCTATACGCCAGAACCTCGTCGGCGAAGAAGGTTCCCTCA ATGTAGTCCATCAGGCCGAACCTCTCGAGGGGGGGCCCGGTACCCAATTC GCCCTATAGTGAGTCGATTACAATTCACTGGCCGTCGTTTTACAACGTCG TGACTGGGAAAACCCTGGCGTTACCCAACTTAAGTCGCTTTGCAGCACAT CCCCC

)



Preliminary Qualification of Mutants

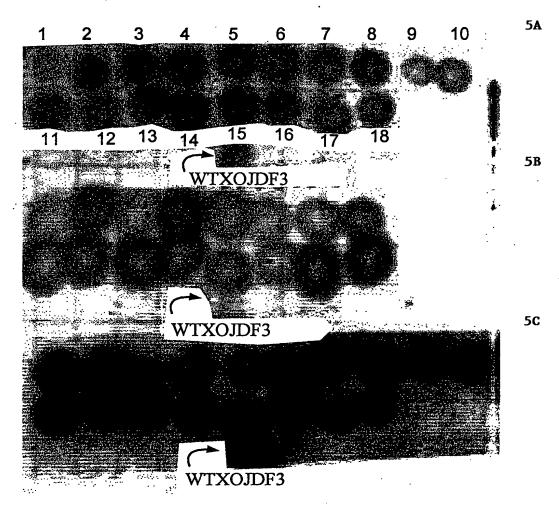


FIG. 5

SUBSTITUTE FIGURE



Sequencing with Purified Mutants

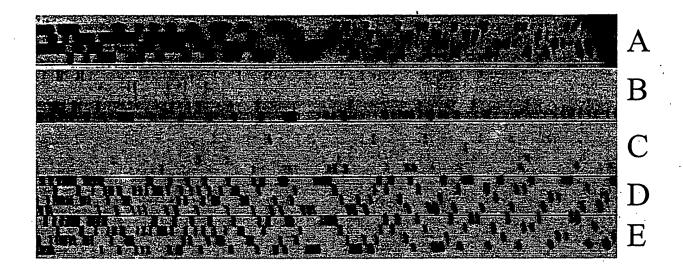


Figure 6



Sequencing with Dye-labeled Dideoxynucleotides

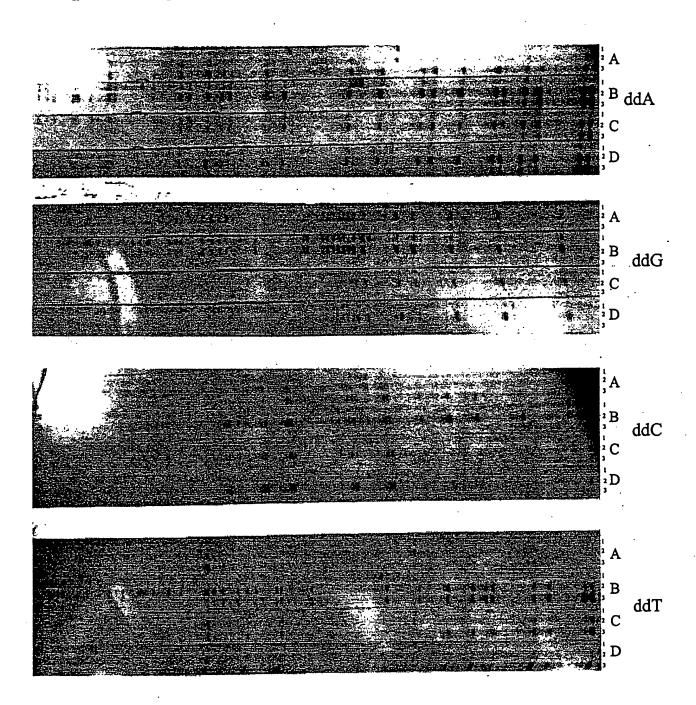


Figure 7



Sequencing with the P410L, A485T Double Mutant and α -33P Dideoxynucleotides

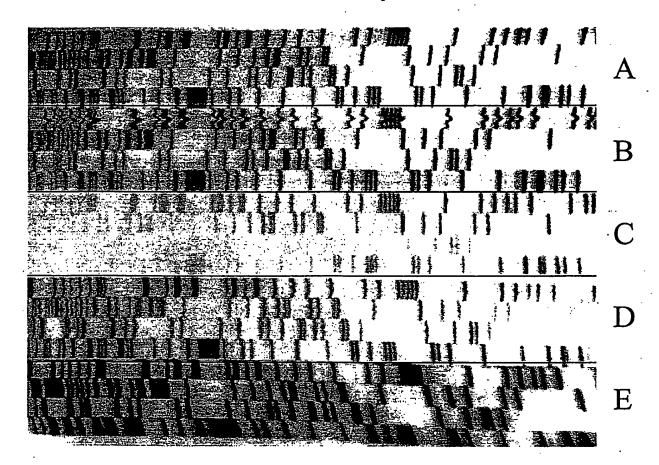


Figure 8

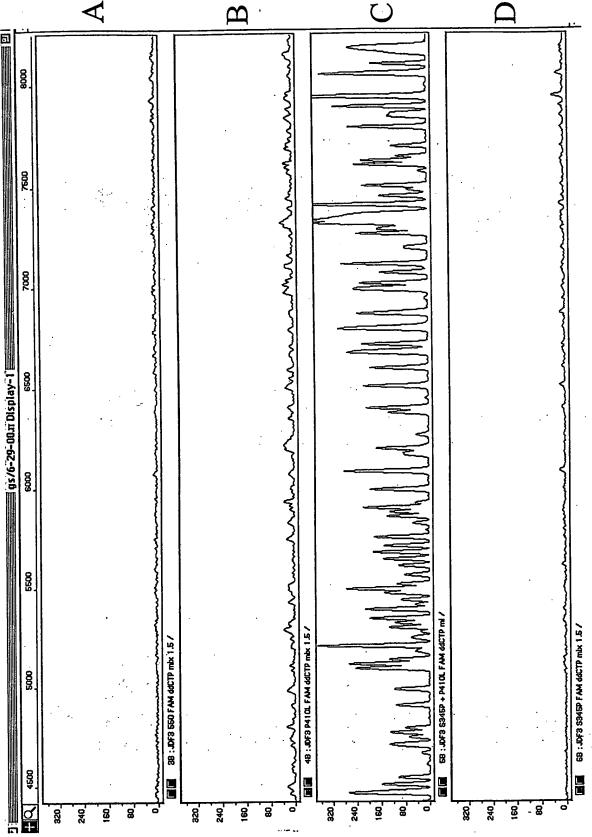


Figure 10

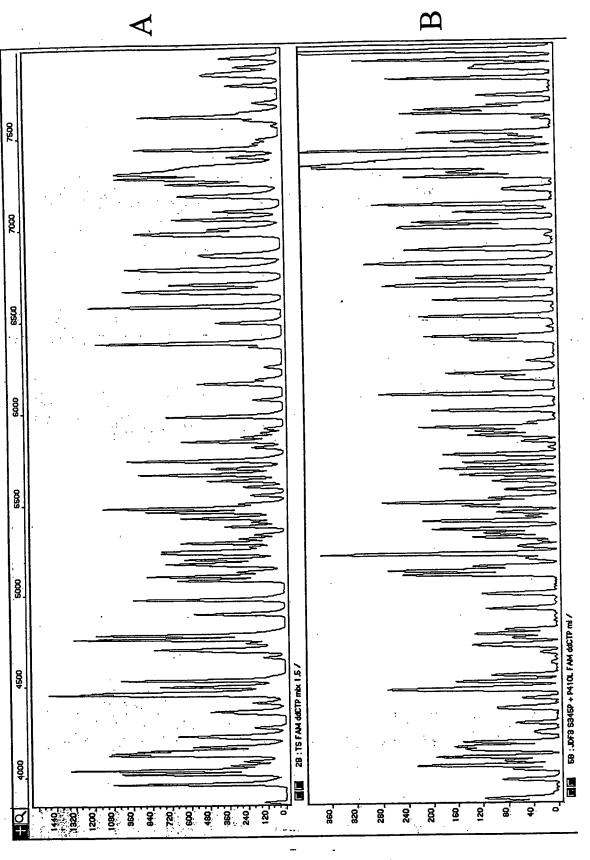


Figure 11



33**P**-TAACGTTGGGGGGGGCA→ TGCAACCCCCCCGTAT

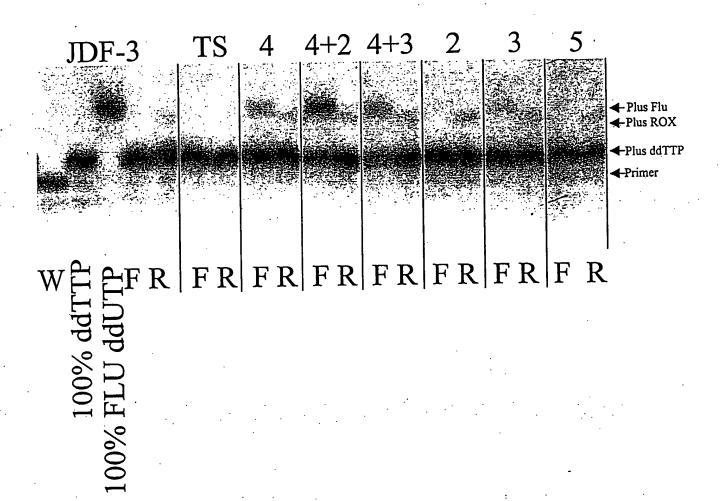


Figure 12



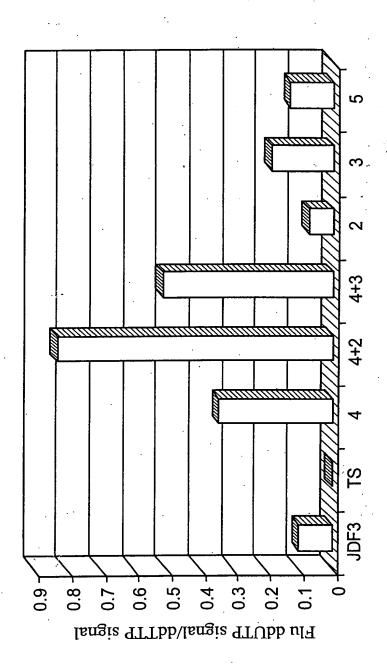


FIG 13

SURSTITUTE FIGURE



4	1	LVXNAXSTGNLVEWFLLRK
10	1	
. 13	1	VWDVSRSSTGNLVEWFLLRK
16	1	VWDVSRSSTGNLVEWFLLRK
18	1	VWDVSRSSTGNLVEWFLLRK
19	1	WWW.XSTRANGUENERS
28	1	VWDVPRSSTGNLVEWFLLRK
34	1	
41	1	VWDVSRSSTGNLVEWFLLRK
33	1	WINDYSPSSTEMIA TO THE TOTAL THE TOTA
48	1	YWSXPXLRTGNLVEWEILIRK
55	1	Vigtxprstgnlvewfllrk
64	ī	XXXFWDVSRSSTGNLVEWFILLRK
Jdf3	301	
bars	301	TODOLEKVAKISMEDAKVII EDOKETT FREAQESKEIGOE POKOSSTONII VENKINSKK
4	20	AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
10	21	the contract of the contract o
13	21	
16	21	
	21	
18		AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
19	21	AYERNELAPNKPDERELARRRGGYAGGYVKEPERG <mark>O</mark> WDNI <mark>A</mark> YLDFRSLYPSIIITHNVSP
28		AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
34	21	
41	21	
33	21	
48 ·	21	AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
55	22	AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRS <mark>H</mark> YPSIIITHNVSP
64	24	AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
Jdf3	361	AYERNELAPNKPDERELARRRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
4	80	DTLNREGCRSYDVAPEVGHKFCKDFPGF1PSLLGNLLEERQK1KRKMKATLDPLEKNLLD
10	81	
13	81	
16	81	DTLNREGCRSYDVAPEVGHKFCKDFPGF1PSLLGNLLEERQK1KMKMKATLDPLEKNLLD
18	81	DTLNREGCRSYDVAPEVGHKFCKDFPGFIPSLLGNLLEERQKIKRKMKATLDPLEKNLLD
[.] 19	81	DTLKREGCRSYDVAPEVGHKFCKDFPGF1PSLLGNLLEERQK1KRKMKATLDPLEKNLLD
28	81	DTLNREGCRSYDVAPEVGHKFCKDFPGFIPSLLGNLLEERQKIKRKMKATLDPLEKNLLD
34	81	
41	81	DTLNREGCRSY <mark>X</mark> VAPEVGHKFCKDFPGF1PSLLGNLLE <mark>V</mark> RQK1KRKMKATLDPLEKNLLD
33	81	
48	81	DTLNREGCRSYDVAPEVGHKFCKDFPGF1PSLLGNPLEERQK1KRKMKATLDPLEKNLLD
55		DTLNREGCRSYDVAPE <mark>D</mark> GHKFCKDFPGFIPSLLGNLLEERQKIKRKMKATLDPLEKN <mark>H</mark> LD
64		DTLNREGCRSYDVAPEVGHKFCKDFPGFIPSLLGNLLEERQKIKRKMKATLDPLEKNLLD
Jdf3		DTLNREGCRSYDVAPEVGHKFCKDFPGF1PSLLGNLLEERQK1KRKMKATLDPLEKNLLD

Figure 14

JUL 2 5 2003 YRQRAIKILANSYYGY<mark>C</mark>GYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD YRORAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 10 141 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 141 13 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 141 16 YRQRAIKILAN<mark>N</mark>YYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 141 18 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 141 19 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 28 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 34 141 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 41 141 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 33 141 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 141 48 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD 55 ${\tt YRQRAIKILANSYYG} \overline{{\tt N}} {\tt YGYARARWYCRECAESV} {\tt TAWGREYIEMVIRELEEKFGFKVLYAD}$ 64 YRQRAIKILANSYYGYYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD Jdf3 481 200 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 4 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 10 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 13 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELKYEGFYVRGFFVTKKKYAVIDEE 16 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 18 201 TDGLHATIPGADAETVKKKAMEFLNYINIKLPGLLELEYEGFYVRGFFVTKKKXAVIDEE 19 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 28 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 34 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 41 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLE<mark>P</mark>EYEGFYVRGFFVTKKKYAVIDEE 201 33 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 48 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 202 55 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE 64 204 541 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGLLELEYEGFYVRGFFVTKKKYAVIDEE Jdf3 260 GKITTRGLEIVRRDWSEIAKETQARVLEAYLRHGDVEEAVRIVREVTEKLSKYEVPPEKL 4 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPE<mark>E</mark>L 10 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVR<mark>K</mark>VTEKLSKYEVPPEKL 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPEKL 16 GKITTRGLEIVRRDWSEIAKETQARVLEAILRH<mark>D</mark>DVEEAVRIVREVTEKLSKYEVPPEKI 18 GKITTRGLEIVRRDWS<mark>K</mark>IAKETQARVLEAILRHGDVEEA<u>T</u>RIVREVTEKLSKYEVPPEKI 19 261 GKI<mark>ATRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVRE</mark>VTEKLSKYEVPPEKI 28 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKL<mark>M</mark>KYEVPPEKL 34 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPEKI 41 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPEKL 33 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPP $\overline{f v}$ KL 48

Figure 15

55

64

Jdf3

264

601

GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPGEA

GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPEKL

GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPEKL



Preliminary Qualification of Mutants

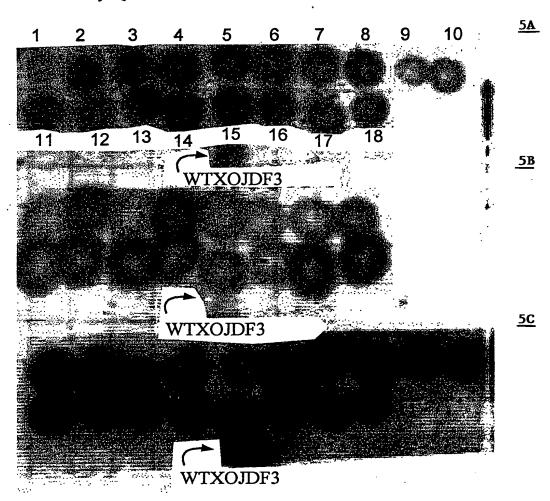


FIG. 5